

boxelder is widespread, the moth may be more common than previously thought but has gone undetected.

I am grateful to J. Richard Heitzman for his aid in identifying and determining the sex of the specimens and for being so generous with his time and knowledge. My son, James Adams, deserves my thanks for reviewing this manuscript.

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ON THE ORIGIN OF SNOT BUTTERFLIES
(*LIBYTHEANA BACHMANII LARVATA*, LIBYTHEIDAE)
IN A 1978 MIGRATION IN SOUTHERN TEXAS

Southern Texas periodically is the scene of migrations by the snout butterfly, *Libytheana bachmanii larvata* (Strecker). The last massive migration in Texas occurred during summer 1971 (Helfert, 1972, Entomol. News 83:49-52; Neck, 1983, J. Lepid. Soc. 37:121-128). More frequent than these "cloud-type" migrations are the smaller-scale migrations which rarely extend beyond the northeastern boundary of the South Texas Plains (line from San Antonio to the Gulf Coast north of Corpus Christi). A series of these more restricted migrations was observed during four traverses of the area in June, July and September of 1978. Comments from two observers will be integrated into personal observations. The primary thrust of the investigation of this migration was to determine the geographical origin of the migrating butterflies. A secondary thrust was to document a relationship between density of butterfly flights and local habitat.

28 June 1978. On the Coastal Plain of Texas, a low-density migration was observed from north of Refugio, Refugio Co., to south of Sinton, San Patricio Co. (Fig. 1). Density of migratory snout butterflies varied with vegetation and urban/rural settings (Table 1). Snout butterflies were not very common over recently-harvested sorghum fields, were most abundant in areas of invaded brush patches (dominated by mesquite, *Prosopis glandulosa*), and were less common but not absent from urban areas, e.g. Woodsboro (a small farming community center). Note should be made that some brush plots exhibited no flying butterflies.

Most snout butterflies were flying an approximate west-to-east flight path. Azimuth directions of compass heading of butterflies at four localities were as follows: 1) Refugio, 110°; 2) Sinton, 115°; 3) IH37/US 77 bridge over Nueces River, 85°; and 4) 5 km south of Kingsville, 80°. These flight lines were extended inland in an attempt to discover source regions of these butterflies. While no information is available on the distance flown by these butterflies, flight lines (Fig. 1) indicate a broad source area for the observed snout butterflies. Several butterflies were observed moving westward temporarily as a result of vehicle-caused air turbulence. Several butterflies were observed being forced along the axis of the highways when two semi-trailer trucks approached and passed each other. The only other butterfly species associated with the migrating snouts were occasional specimens of the queen, *Danaus gilippus strigosus* (Bates), which totaled less than five percent of the total butterfly count.

2 July. Traveling northward from Brownsville, Cameron Co., the first snout butterflies were encountered just north of Kingsville. Butterflies were traveling eastward (exact azimuths not measured) and were common to Robstown and Mathis. Snout butterflies

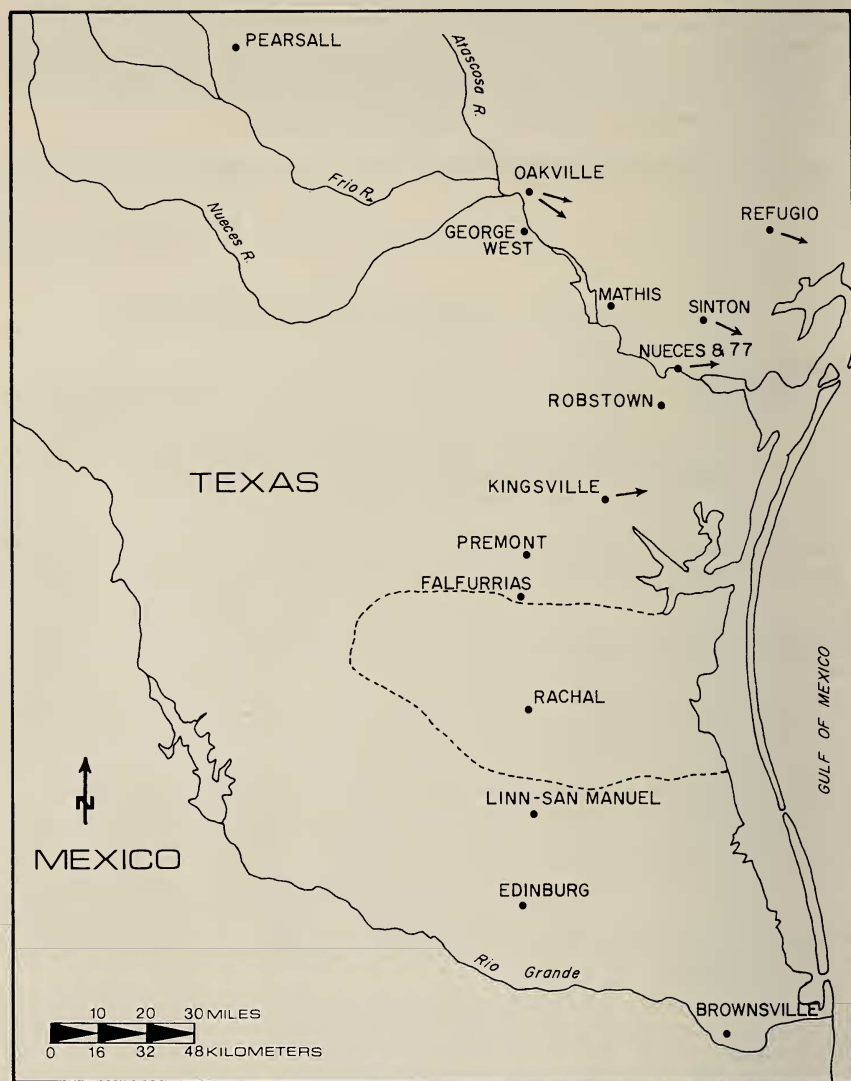


FIG. 1. Map of southern Texas with localities of observations and flight directions of *Libytheana bachmanii* larvata.

were extremely abundant southeast and north of Oakville. Flight directions were variable, but the majority were flying somewhat south of east (Fig. 1). A sample of the snout butterflies revealed that freshly-emerged adults of both sexes were migrating (no sex-ratio recorded). Associated species were (*Kricogonia lyside* (Godart) (yellow and white morph), *Eurema lisa* Boisduval and Le Conte, and *Phoebis sennae* (Linnaeus)). These species were much less common than the snouts, which represented approximately 99% of the migrant butterflies.

TABLE 1. Number of snout butterflies, *Libytheana bachmanii larvata*, observed in highway driving counts, summer 1978.

| Habitat | Highway length (km) | Butterfly number |
|---|------------------------|------------------|
| 28 June | | |
| Woodsboro | 1.1 | 5 |
| Nueces River bridge | 0.5 | 8 |
| Cut sorghum field | 0.5 | 0 |
| Brush plot | 0.5 | 15 |
| 26 September (south of George West)—paired habitats | | |
| Pasture-Brush | 0.6 each | 5-9 |
| Pasture-Brush | 0.6 each | 12-24 |
| Pasture-Brush | 0.6 each | 39-47 |

Observation by informants. A letter dated 28 June 1978 from George Toalson of Pearsall, Frio Co., reported "thousands" of snout butterflies which exhibited no "particular direction in their flight pattern" and were observed to "congregate at damp places on roadsides and on anything that has flowers on it." Phone conversation with Toalson revealed a slow buildup in the Pearsall area. Rains had occurred in mid-May and early June. Common plants visited were virgin's bower (*Clematis drummondii*) and cowpen daisy (*Verbesina encelioides*). Many snout butterflies had been killed by pesticide which had been sprayed on a field of peas; the "ground appears brown with bodies." Note that snout butterflies had been observed in 1971 in Austin, Travis Co., feeding at internodes of bean plants (Neck, op. cit.).

J. Stephen Neck reported to me on 10 July that he observed no snout butterflies between Brownsville and Austin (via highways 77, 181, 80 and 183) on that day.

26 September. Driving south from Austin, snout butterflies were first encountered near Oakville where movements were in varied directions. In the region from 8 to 13 km south of George West, Live Oak Co., snout butterflies generally were traveling in directions between 105° and 125°. At a point 29 km south of George West (Live Oak-Jim Wells County line), they were flying as high as 3 m above the soil surface, although some individuals were observed to land upon the road bed (U.S. 281). Also present were a number of *Phoebis sennae*, some of which exhibited courtship behavior.

A series of paired brush and pasture segments between 30 and 35 km south of George West in Jim Wells Co. revealed greater numbers of snouts crossing the highway in areas with native brush communities than areas with pastures (Table 1). The effect, however, appears to lessen as butterfly density increases. In this area brush communities are dominated by brasil (*Condalia hookeri*), whitebrush (*Aloysia gratissima*), mesquite, retama (*Parkinsonia aculeata*), guayacan (*Porlieria angustifolia*) and granjeno (*Celtis pallida*). This last species is the prime larval foodplant of the snout butterfly in southern Texas. Pastures are dominated by buffelgrass (*Cenchrus ciliaris*), an exotic grass native to Africa. Butterflies flying at the same sites included *Euptoieta claudia* (Cramer), *Eurema lisa*, *Zerene cesonia* (Stoll), *Phoebis sennae*, *Papilio cresphontes* Cramer, *Danaus gilippus* and *Anaea andria* Scudder. Also present were substantial numbers of the green darner dragonfly, *Anax junius*. A few snout butterflies were observed chasing *D. gilippus*.

Moving southward I approached the southeastward edge of the area containing large numbers of snout butterflies. A few were seen in Premont, but none were seen in Falfurrias. West of Falfurrias on Farm-to-Market 285, snout butterflies were abundant. Most individuals were moving approximately southward, although some were flying in the opposite direction. One individual altered its flight direction by 180° when approached by a group of 10 to 12 snout butterflies. Migrating snout butterflies had been observed

by local residents for three days. South of Falfurrias in the vicinity of Rachal, they were much less common. Very few were observed at Linn-San Manuel. No snout butterflies were observed in the Lower Valley between Edinburg and Brownsville.

29 September. Traveling northward from Brownsville again, no snout butterflies were observed until an area north of Mathis (on Farm-to-Market 359) was reached. In the area south of Mathis, a large number of butterflies were observed crossing the highway; over 90% were *Danaus gilippus*. *Anax junius* was once again common. Even in the Mathis area, snout butterflies were not common.

Origin of migrating snout butterflies. Observation of flight directions of snout butterflies in areas with near unidirectional movements (Fig. 1) indicates that some area of inland southern Texas was the source area of the 1978 snout migration. Observations along the margins of this inland area revealed large scale movements without concentrated peaks of compass directions, but with a tendency for flight away from an area still further inland. Backward tracing of flight directions and the observations of Toalson indicates a source area south of San Antonio which includes the vicinity of Pearsall. Brush communities in this area of southern Texas contain large percentages of *Celtis pallida*, the favored larval foodplant of the snout butterfly. Low densities of snout butterflies observed south of Falfurrias are indicative of the lack of *C. pallida* in the Llano Mesteno, a large area of mixed grassland and savannah.

Analysis of previous snout butterfly migrations (e.g. Neck, op. cit.) has revealed an association with exceptionally heavy rainfalls. A large, cloud-type migration in 1971 followed widespread, heavy rains in southern and central Texas. These summer rains followed the intense drought of 1970 and 1971.

The 1978 migration discussed above is believed to be related to precipitation patterns, although the system operating in 1978 differed significantly from 1971. The period from summer 1977 to spring 1978 was characterized by rainfall deficiencies (Climatological data—Texas, U.S. Department of Commerce). Drought conditions were not as severe as the situation present in early summer 1971, however. Higher than normal rainfall occurred in May and June (1978) but was spotty in distribution; general rains were not experienced at this time. Rainfall in July was generally below normal, while August was wetter than normal.

The scattered nature of the 1978 rainfall (in both time and space) resulted in a mosaic of areas with flush growth of the larval food plant, *C. pallida*. Isolated centers of butterfly concentrations developed and generated the comparatively local migrations which were observed in July and September 1978.

The lack of migrating snout butterflies in deep southern Texas was due to two factors. Lack of butterflies in the Llano Mesteno area was due to lack of the prime larval foodplant. Lack of butterflies south of the Llano Mesteno in the Lower Rio Grande Valley (area along the Rio Grande, including Brownsville) was due to lack of heavy rainfall. Continued drought in this latter area precluded rapid growth of the prime larval foodplant, *C. pallida*.

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